Social Capital Deficit in Online Learning: An Ego-Centric Approach to Occupational Attainment

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Keywords: Social capital | social networks | online learning | job mobility

Article:

*****Note: Full text of article below**

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1. Introduction

Enrollments in online courses continue to increase in higher education [1]. Online programs offer convenience and choice allowing students to determine when, where, and how to undertake a program of study. Library and information science (LIS) programs in the United States (U.S.) have been offering online courses since the late 1990s. Although an online course may include some form of face-to-face interaction by definition [2], online classes offered by the majority of American Library Association (ALA)-accredited LIS programs require little to no face-to-face instruction [3].

Students tend to perform similarly or better in online classes than in face-to-face classes [4]. However, students often face challenges including a sense of disconnectedness, loneliness and isolation, and the lack of bonding interaction due to geographical and temporal separation in online education [5–7]. Such challenges put online students at a disadvantage after graduation because of inequity in access to social capital compared to their peers who had more in-person interaction while in the program. Students' ability to expand their social networks with their peers and professors while attending school is critical as the scope of their social networks could further their professional careers [8–10].

As LIS programs heavily rely on online learning to train future library and information professionals, it is vital for administrators and educators to understand the potential implications of online education on graduates' ability to form network of connections while in school; an overlooked research area in the field. Successfully transitioning from graduate school to the field as a professional is an important milestone for graduates. This transitioning may be more challenging for those who took all or a majority of their courses online because of their unequal access to social networks that can be a great asset in their employment procurement activities. Research has shown that social networks can not only facilitate [12–15] the employment procurement process including access to employment information but also play a critical role in

securing employment [10,16,17]. The facility to procure employment, in part, depends on the job seeker's ability to *access* and *mobilize* social capital embedded in his/her social network [11].

This study is aimed at understanding the impact of online learning on development of social capital. The following research questions guided the study:

1. What are the compositional characteristics of graduates' social networks?
2. To what extent do graduates' social networks contribute to their access to job-related information?

The research focused on graduates who took varying amounts of online classes from a few courses to a fully online program to complete their master's degree in library and information science (MLIS) degree to answer the research questions. The compositional characteristics of graduates' social networks (e.g., contact role) and the role of social connections were explored when they seek employment information after graduation to assess their social capital.

2. Social Networks and Social Capital in Occupational Attainment

The job search as an information-gathering process involves the job seeker's self-assessment of personal characteristics, educational background, and expertise, and in particular, procurement of information about job openings [18]. Social networks often play a critical role in accessing job-related information and procuring employment [12,19–21]. Therefore, structure and composition of social networks as a resource can determine the volume of social capital [22] an individual has and influence employment outcomes from securing an interview and gaining employment to change in earnings and job satisfaction [12,17,21,23–25].

2.1 Social Capital and Social Networks

Social networks can determine "the flow and the quality of information" [20]. The pattern of relationships an individual has with others can be considered as a social network [26,27]. Through such information relationships the time and investment required to collect crucial knowledge is reduced [27]. Examination of the structure and composition of social networks reveals how and what kinds of resources are exchanged among those who are in the network [28]. Such resources are described as social resources that are embedded in an individual's (ego) social network and include ties with others (alters) in the network [29]. Social resources can be leveraged by ego to accomplish specific goals including employment procurement. Ties that ego has with alters may vary in strength. Ties with close friends and family members may be considered as strong ties whereas those with acquaintances and professional contacts may be regarded as weak ties [30]. Weak ties link individuals to information available in other close-knit networks, acting as a bridge [12]. Weak ties in the network mechanism can provide non-redundant, highly useful information about job opportunities for the job-seeker. Such information is less likely to be available within a network of strong ties as those who are connected to ego via strong-ties are more likely to know each other and thus, ego receives redundant information. Therefore, information that flows through weak ties can be crucial for

social mobility. On the contrary, during economic downturns strong ties may prove to be more useful when weak ties do not feel sufficiently motivated to provide assistance [12,17].

The bridging aspect of the network in terms of gaps among alters and ability to access their subsequent networks are more critical for ego [20,31]. The more separated the alters and their networks from each other are, the more useful and non-redundant information ego receives by exploiting *structural holes* in the network [31]. Increase in network diversity in terms of alters' socioeconomic status can promote structural holes in the network. Campbell, Marsden, and Hurlbert [32] found that higher socioeconomic status was positively associated with increased network diversity. Density of weak ties in the network is also important for increased network diversity as they are more heterogeneous. Those who are in middle career stage (ages 40 to 55) tended to have greater network diversity than those who are in early career (ages 20-40) and late career stages (ages 55 to retirement) [33]. However, the assessment of tie strength (weak versus strong) can be more accurately identified by measuring ego's emotional closeness, frequency of communication, and duration of the relationship with alters [34] rather than by relying on role category (e.g., acquaintances). Therefore, it is in ego's best interest to have a network composed of more weak ties and contacts who have higher socioeconomic status than ego in the network [11].

Social networks serve a form of social capital and making connections through networking is the initial step in developing social capital. An aspect of social capital is the "overall pattern of connections between actors" [27]. In other words, it is related to the ability of members of a social system to make connections with each other. Through these connections which can be characterized as *information channels,* the time and investment required to collect crucial knowledge is reduced [27]. From the perspective of status attainment, social capital can be described as "embedded resources in social networks" [21] that one can *access* and *mobilize* through his/her location in a social network [35] to achieve certain goals. Such embedded social resources refer to those that are possessed by the alters including their social, economic, or political positions as well as resources in their own networks, that can be accessed by the ego through direct or indirect ties [29]. Availability of such social resources in ego's network and ego's ability to access these resources to promote self-interests when needed can be characterized as the accessed social capital. Interpersonal relationships play an important role in maintaining accessed social capital as improving perceived strength (e.g., frequency of communication) of ties facilitates ego's ability to gain access to embedded resources in the network [27]. Utilization of ego's accessed social capital for employment procurement purposes refers to the mobilization of social capital. It is well established that these two dimensions of social capital play critical roles in employment procurement [11] and the lack thereof may put the job-seeker at a disadvantage both in the job market and in the professional life.

2.2 Deficit in Social Capital

The number of online course offerings in ALA-accredited LIS programs has increased more than three-fold while the number of traditional course offerings has dropped by 40% since 2000

[36,37]. While such a dramatic rise in online offerings helped increase access to LIS education [38], online MLIS students feel isolated and disconnected from their peers [5,39] as much as their peers in other disciplines [6,7,40]. Such challenges tend to negatively affect their motivation to engage with each other and build their social capital while in the program [41]. For example, Marshall et al. [42] found that LIS graduates relied mostly on programs to help them reconnect and communicate with their peers. Such disconnectedness may be considered as an indicator of limited scope of their social capital that includes their MLIS peers.

Further, the percentage of students enrolled in LIS programs who are under the age of 29 has been on the rise over the past decade while those in the 30 to 54 age group have declined as shown in Figure 1. These students (under 29) are more likely to have limited relevant work experiences [e.g., 39,43]. Such a demographic shift in the student profile coupled with increased online offerings in LIS and challenges associated with online education can lead to a deficit in social capital for students. Furthermore, increased age homogeneity in MLIS programs may promote less diverse social networks in terms of age [44] for graduates. Deficit in *accessed* social capital especially may have significant ramifications on graduates' career prospects.

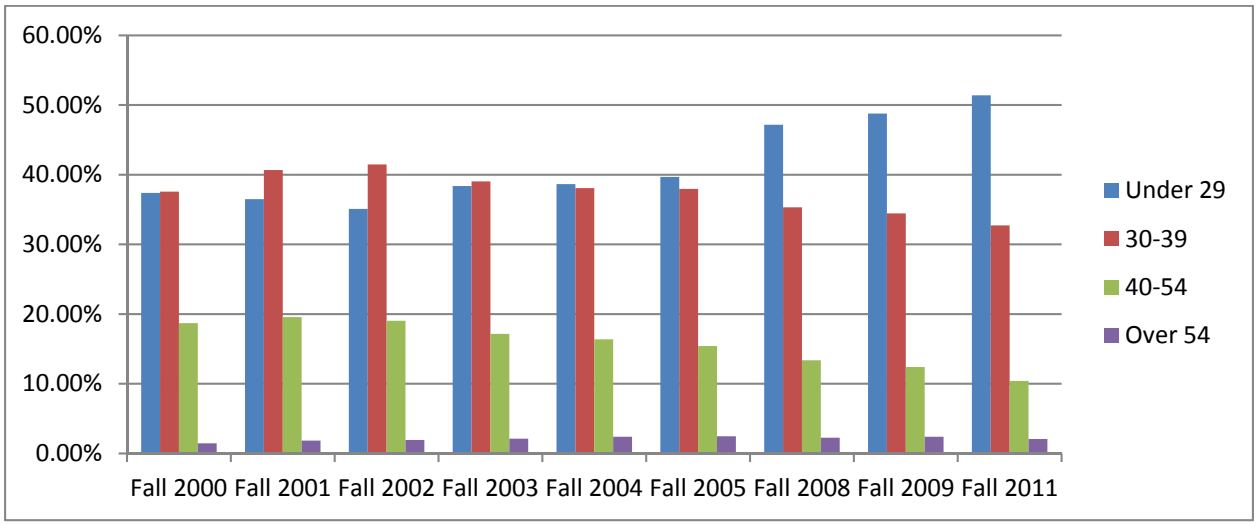

Figure1. Enrollments in LIS Programs by Age

Those who are above the age of 30 include both paraprofessionals in the field and those who want to make a career change. These students are more likely to have extensive occupational social networks which may be of great value for their younger peers. Individuals who are in the 30 to 54 age group are generally considered to be in their late early-career or middle career stages, who tend have much diverse social networks and larger occupational accessed social capital than their peers who are either younger or closer to retirement [33,45]. As employment of librarians is expected to grow slower than the average for all occupations over the next decade [46], a tight job market argues in favor of the value and use of social capital [47].

3. Methods

The research focused on graduates of LIS programs who took varying percentages of online classes to meet MLIS program degree requirements to assess the impact of online learning on graduates' social capital. The characteristics of graduates' social networks were evaluated using ego-centric social network analysis and non-parametric statistical tests.

3.1 Participants and Program Residency

Alumni who graduated between spring 2006 and summer 2011 semesters from three ALA-accredited LIS programs in the Southeastern US were chosen because of the different course delivery options employed. These programs were purposely selected to include a range of online and face-to-face class ratios. One program offered less than 50% of its courses online; therefore most of the graduates who participated in the study completed a majority of degree requirements in face-to-face settings. The second program offered the degree in both face–to-face and online settings with no residency requirement, therefore some graduates had little or no face-to-face interaction with peers or professors. The third program offered most of its courses online with a few optional blended courses. While fully online at this time, the program still requires new students to attend a onetime intensive weekend session. Though graduates of this program had access to limited face-to-face interaction with their peers and professors, most of those graduating between spring 2006 and summer 2011 completed the degree requirements entirely online.

3.2 Data Collection and Analysis

Since the research attempted to explore connectedness of MLIS graduates and how it contributes to their employment prospects, an egocentric approach [28,48,49] was selected to investigate the relationships that graduates had with others who provided assistance in their pursuit of new employment opportunities. This approach was suitable as it was not possible to describe the boundaries of graduates overall networks. To minimize the recall data problem, graduates were asked to look back over the last six months [50] when identifying contacts with whom they exchanged information related to employment opportunities.

An online survey questionnaire was administered to collect the data. The questionnaire consisted of two sets of multiple-response items adapted from Granovetter [12] and Burt [34] to measure tie strength (e.g., emotional closeness, relationship duration) with additional items created to address specific aspects of the research questions. Respondents answered close-ended questions which provided a limited number of opportunities for brief explanation or expansion.

The first set of questions focused on graduates' demographics information. The second set of questions focused on graduates' employment status and enrollment levels in different course modalities (online vs. face-to-face). Lastly information about graduates' personal networks was collected using a name generator method [28,34]. Respondents were asked to list up to five alters and respond to a set of questions for each named alter [51]. Since questions of graduates' social networks were part of a larger questionnaire, questions related to structural holes (alter-alter relationships) [34] were left out due to the questionnaire's overall length.

Two programs provided a list of names and current email addresses for their students who graduated between spring 2006 and summer 2011 semesters (n=469). The third program allowed access to a listserv used to communicate with graduates (n=533). An invitation to respond to an online survey was sent to each of the email addresses provided and also to the listserv. To increase the response rate, a tablet computer was raffled off to one randomly selected respondent. Two hundred and nineteen responses were usable, yielding a 21% response rate. For the purposes of this paper, only 152 responses were included in the data analysis as these respondents listed at least one person (alter) in their personal social networks.

Responses related to graduates' personal social networks were analyzed using E-Net [49], a software program for analyzing ego-centric network data, and SPSS statistical analysis software. Analyses of alter variables and data from other close-ended questions were analyzed using tests relevant for examining relationships among both scalar and categorical variables including non-parametric tests (e.g., Pearson's chi-square, Kruskal-Wallis, and Mann-Whitney U tests).

4. Results

The results are divided into three main sections: demographics information, ego network characteristics (network composition, tie strength, homophily, and heterophily), and employment outcomes. Within each section, online class intensity refers to the percentage of classes taken in online format. Age information for both ego and alters were collected in six categories ranging from *under 24* to *65 and over*. These categories were collapsed into three categories for descriptive analyses purposes. In calculation of homophily and heterophily statistics, age categories were not collapsed to accurately capture the network diversity in terms of age. Online class intensity levels were also collapsed as appropriate for statistical analyses purposes. The total number of responses may not add up to 152 for some of the questions due to occasional permitted nonresponse. Non-parametric tests were applied where sample size was appropriate.

4.1 Demographics

Table 1 summarizes demographics information of the respondents. Almost all of the respondents had an employment (full-time or part-time). While about 30% of respondents completed the program with no face-to-face instruction, all respondents had an online class experience during their studies. On average, it took a little over two years ($\overline{x}$=27 months, SD=8.4) for respondents to complete the degree requirements.

Table 1. Demographic Information

	Number	Percent of Total
Age (n=152)		
Under 34	84	55.3
34 - 55	63	41.4
Over 55	5	3.3

Gender (n=151)		
Male	31	20.5
Female	120	79.5
Employment Status (n=152)		
Employed	148	97.4
Unemployed	4	2.6
Job Mobility **[post MLIS]** (n=152)		
Retained same job	65	42.8
Found new employment	87	57.2
Temporal Proximity to MLIS graduation (n=152)		
Less than 12 months	48	31.6
12 – 24 months	36	23.7
Over 24 months	68	44.7
Online Class Intensity (n=152)		
Low Online (less than 49%)	44	29
Moderate-High (50% to 99%)	63	41.4
Entirely Online (100%)	45	29.6

Almost all of the respondents were employed at the time of research. While all graduates were employed while at school, about 70% of them worked in a library setting in various capacities. A large majority of those (68%) who did not have full-time employment while in school found new employment after graduation whereas only half of those who had full-time jobs found new employment (x^2=4.221, p<0.05). Overall, 57% of all respondents secured new employment after graduation.

Although most of those who found new employment after graduation tended to earn more than those who did not change jobs, the difference was not statistically significant. On the other hand, those who were under 34 were more likely to change jobs after graduation (x^2=11.117, p <0.01)[1].

Temporal proximity to the MLIS graduation, defined as time passed since respondents' graduation until the time they responded to the survey, ranged from two months to a little over 4 years ($\overline{x}$=19.2 months, S.D=13.8). As shown table in Table 2, a large majority of those graduated over two years ago found new employment whereas recent graduates (less than 12 months) often

[1] The over 55 category was not included for statistical analysis purposes due to small sample size (n=5).

retained their current employment (x^2=27.675, p<0.001). Overall 62% of those who found new employment did so over two years or later after graduation.

Table 2. Job Mobility after Graduation by Temporal Proximity

Temporal Proximity	***Less than 12 months (n=48)***			***12-24 months (n=36)***			***Over 24 months (n=68)***		
Online Class Intensity†	Low %	Med %	Ent %	Low %	Med %	Ent %	Low %	Med %	Ent %
Job Mobility (n=152)									
Found New Employment	2.1	12.5	16.7	16.7	16.7	16.7	27.9	38.2	13.2
Retained Employment	18.8	25	25	13.9	19.4	16.7	5.9	8.8	5.9
Total	100%			100%			100%		

†Online Class Intensity levels: Low= Low Online; Med= Medium-High; Ent= Entirely Online

Although a large majority of respondents took most or all of their coursework online, all age groups were somewhat proportionally represented in these three online class intensity levels across temporal proximity categories as shown in Table 3.

Table 3. Respondents' Age by Temporal Proximity

Temporal Proximity	***Less than 12 months (n=48)***			***12-24 months (n=36)***			***Over 24 months (n=68)***		
Online Class Intensity	Low %	Med %	Ent %	Low %	Med %	Ent %	Low %	Med %	Ent %
Age (n=152)									
Under 34	8.3	22.9	31.3	13.9	16.7	13.9	16.4	21.7	17.1
34-55	10.4	14.6	10.4	13.9	19.4	19.4	11.2	18.4	11.8
Over 55	2.1	0	0	2.8	0	0	1.3	1.3	0.7
Total	100%			100%			100%		

Among these age groups, the under 34 group was the most active in terms of job mobility. About half of the graduates who took a majority or all of the courses online found new employment whereas about 25% of those who took primarily face-to-face classes found new employment. About 70% of the respondents who graduated about a year or two ago across three online class intensity levels found new employment. About 90% of those graduated over two or more years ago found new employment regardless of their online class intensity levels.

In the case of those were in the 34-55 age group, job mobility was very low at about the 20% level across all online class intensity levels for recent graduates. About 30% of those in the next

temporal proximity category found new employment. However, those who graduated over two or more years ago had much higher job mobility at around 65%.

Job mobility of graduates who were over the age of 55 was very limited. It should be noted that the sample size (n=5) for this age group was very small for further analysis.

4.2 Ego Network Characteristics

Results in this section focus on the compositional measures that summarizes characteristics (e.g., closeness, age) of a graduate's (ego) alters as well as egos' propensity to have ties with alters in the same age and role (e.g., MLIS peer). Egocentric measures of composition (e.g., age, role) and quality (i.e., employment procurement) were used to assess graduates' level of social capital [52].

A large majority of respondents (66%) named five alters ($\overline{x}$=4.14; SD=1.36). Those who were under 34 and found new employment after graduation tended to list more alters than their older peers who retained the same employment.

4.2.1 Alters

A large majority of alters in graduates' networks were either their MLIS peers or LIS professionals whom they knew as colleagues or in a professional capacity (e.g., mentor). Respondents were allowed to choose only one category for their contacts to distinguish their MLIS peers from other professional and non-professional contacts.

Respondents included those who graduated in a 5-year period, therefore graduates' network compositions as a function of temporal proximity to MLIS graduation ($\overline{x}$=19.2 months, S.D=13.8) were examined to more accurately capture the differences in their networks. As temporal proximity to MLIS graduation decreased, graduates' networks included fewer MLIS peers, and faculty/staff, and more professional contacts and acquaintances/friends from outside of the profession (x^2=19.200, p<0.05). Outside of the content field, contacts (*family member/relative*, *acquaintance/friend*, and *other*) were combined as non-LIS social contacts. Additionally emotional intimacy categories were reclassified as strong (close and especially close) and weak ties (distant and less close) for statistical analyses purposes.

Networks of recent graduates (less than 12 months) who had face-to-face instruction experiences (low and medium-high online) featured their peers from MLIS (41.8%) and MLIS faculty/staff (14.5%) more at significant levels (x^2=16.087, p<0.001). Whereas graduates of entirely online programs included significantly more contacts (40.8%) from outside of the profession (p<0.001).

Furthermore, networks of recent graduates' who had face-to-face instruction experience included more contacts in the 34-55 age group and fewer contacts in other age groups than those who completed an entirely online degree. These differences were statistically significant (x^2=7.694, p<0.05).

Table 4. Alters' Demographics (percentage) by Ego's Online Class Intensity

Temporal Proximity	***Less than 12 months***			***12-24 months***			***Over 24 months***		
Online Class Intensity	Low %	Med %	Ent %	Low %	Med %	Ent %	Low %	Med %	Ent %
Role (n=629)									
MLIS Peer	43.9	40.6	29.3	27.1	20.7	17.3	31.3	16.8	24.6
MLIS Faculty/Staff	24.4	8.7	6.7	20.8	8.6	3.8	4.2	7.6	8.8
LIS Professional	22	31.9	24	25	22.4	51.9	27.1	37.4	43.9
Family Member/Relative	2.4	5.8	16	4.2	17.2	1.9	13.5	14.5	8.8
Acquaintance/Friend (non-LIS)	7.3	11.6	17.3	18.8	25.9	25	21.9	21.4	12.3
Other	0	1.4	6.7	4.2	5.2	0	2.1	2.3	1.8
Age (n=625)									
Under 34	24.4	36.2	39.7	22.9	36.2	36.5	53.1	36.5	10.4
34 – 55	65.9	50.7	37	62.5	51.7	46.2	22.1	55.7	22.1
Above 55	9.8	13	23.3	14.6	12.1	17.3	40.4	40.4	19.3
Closeness* (n=622)									
Distant	0	1.4	8.3	2.1	3.4	1.9	1	3.1	0
Less Close	22.5	27.5	20.8	25.5	25.9	17.3	17.7	22.9	14
Close	50	39.1	30.6	42.6	29.3	44.2	45.8	42	52.6
Especially Close	27.5	31.9	40.3	29.8	41.4	36.5	35.4	32.1	33.3
Relationship Duration‡ (n=625)									
New Relationship	63.4	66.7	54.2	41.7	25.9	32.7	25	17.4	17.5
Established Relationship	24.4	23.2	18.1	33.3	39.7	28.8	47.9	47.7	59.6
Old Relationship	12.2	10.1	27.8	25	34.5	38.5	27.1	34.8	22.8

*Closeness: Distant (contact when it is necessary); Less Close (ok to work/communicate with no desire to develop friendships); Close (close, but not one of the closest contacts); Especially Close (one of my closest contacts)
‡Relationship Duration: New Relationship (met within last 2 years); Established Relationship (known for 3-5 years); Old Relationship (known for 6+ years)

Networks of those graduated between a year or two ago, who had face-to-face instruction experiences, included more non-LIS social contacts (39%), MLIS peers (24%) and MLIS faculty/staff (14%) whereas graduates of entirely online programs listed more LIS professionals (52%) in their networks. The differences were statistically significant (x^2=13.979, p< 0.05). Contacts of those who took a majority or all of the courses online included more contacts who were under 34 than graduates of low online programs. On the contrary, graduates of low online programs had more contacts in the 34-55 age group. However, these differences were not statistically significant.

Networks of respondents who graduated over two years ago or earlier appeared to be somewhat similar to each other in terms of distributions of contact roles regardless of their online class

intensity levels. However, differences were statistically significant (x^2=8.334, p<0.05) between graduates who took predominantly face-to-face courses and those (medium-high and entirely online) who did not. Low online graduates had more MLIS peers (31%) in their social networks than graduates in medium-high and entirely online categories who, on the other hand, had more LIS professionals (39%) in their networks. Additionally, the networks of those in the low online category had more contacts under the age of 34 (53%) whereas other graduates' networks were comprised mostly of contacts in the 34-54 (51%) and the over 55 (21%) age groups (x^2=18.559, p<0.001).

4.2.2 Tie-strength

Although a majority of relationships with alters were new relationships for recent graduates, respondents considered them being close or especially close as they probably knew most them from the MLIS program. However, relationships were more established for graduates with lower temporal proximity (graduated over a year ago or earlier). Communication frequencies with alters showed that email (66.4%) and in-person (54.2%) interactions were the most common platforms for monthly or more frequent communications. Weekly and monthly interactions constituted a majority of the communications by email whereas monthly and daily communications dominated in-person interactions across the three temporal proximity levels. Graduates who had face-to-face instruction experiences had slightly more frequent communication in-person with no statistically significant differences. Graduates who were under 34 reported to have more frequent communications with their contacts than other age groups. Communication frequencies were much higher at about the 80% level for email and about 70% for in-person platforms with contacts whose relationship led to a job opportunity for the graduate.

A majority of the relationships were less than 5 years old among recent graduates regardless of their online class intensity levels. However, relationships for those who had more face-to-face experiences were mostly (89%) 5 years old or shorter whereas entirely online students had more relationships that were over 5 years old (x^2=8.545, p<0.05). A large majority of the relationships (~70%) were characterized as strong ties (close and especially close), however no statistically significant differences were detected between different online class intensity levels among recent graduates.

Networks of respondents who graduated over a year ago or earlier mostly featured strong ties (>70%) and established relationships with no statistically significant differences between online class intensity levels. However, differences were detected in changes in relationship durations. While the number of new relationships decreased, established relationships increased significantly (x^2=13.050, p<0.001) as temporal proximity decreased across three online class intensity levels.

4.2.3 Homophily

Role categories and age attributes were used to examine graduates' propensity to have connections with alters. The E-I statistic score ranges from -1 (only ties with similar alters) to +1 (only ties with dissimilar alters).

Table 5. Homophily Scores (E-I) by Ego's Online Class Intensity (n=629)

Temporal Proximity	***Less than 12 months***			***12-24 months***			***Over 24 months***		
Online Class Intensity	Low	Med	Ent	Low	Med	Ent	Low	Med	Ent
Role	0.122	0.188	0.413	0.458	0.586	0.654	0.375	0.664	0.509
Age	0.073	0.391	0.397	0.125	0.103	0.269	0.104	0.420	0.193

Homophily scores listed in Table 5 support the descriptive observations made about the network composition. Higher E-I scores indicate a somewhat strong preference on the part of recent graduates of entirely online programs for alters with different roles (0.413) than self. In terms of homophily in age, recent graduates with higher online class intensity levels (medium-high and entirely online) showed somewhat strong preference (0.391 and 0.397 respectively) for alters with different age groups than self than those with low online class intensity (U=2081.5, $p<0.01$). For graduates with lower temporal proximity, the networks were less homophilous and indicated strong preferences to connect with alters with different roles than their MLIS peers. In terms of age groups, lower E-I scores did not suggest any preference with the exception of medium-high online class intensity group where a strong preference (0.420) for alters with different age groups was observed.

Table 6. Homophily Scores for Ties led to Job for Ego (n=157)

Temporal Proximity	***Less than 12 months***			***12-24 months***			***Over 24 months***		
Online Class Intensity	Low	Med	Ent	Low	Med	Ent	Low	Med	Ent
Role	0.175	0.562	0.646	0.600	0.742	0.689	0.389	0.725	0.713
Age	0.275	0.552	0.450	0.120	0.229	0.556	0.300	0.378	0.500

Higher E-I scores for ties that led to an employment for the ego suggest a stronger preference on the ego's side for alters with different roles and age groups than self as shown in Table 6. Statistically significant differences were not detected among different online class intensity levels.

4.2.4 Heterogeneity

To measure the amount of diversity in graduates' networks in terms of alter roles and age groups, index of qualitative variation (IQV) scores were calculated, which ranges from 0 to 1 as shown in Table 7. A higher IQV score indicates more diversity in the ego's network. Overall scores suggest that graduates' networks were highly diverse regardless of their temporal proximity to MLIS graduation and online class intensity levels.

Table 7. Heterogeneity Scores (IQV) by Ego's Online Class Intensity (n=629)

Temporal Proximity	***Less than 12 months***			***12-24 months***			***Over 24 months***		
Online Class Intensity	Low	Med	Ent	Low	Med	Ent	Low	Med	Ent
Role	0.676	0.769	0.839	0.747	0.834	0.645	0.850	0.694	0.625
Age	0.815	0.826	0.867	0.847	0.834	0.880	0.709	0.870	0.738

Although IQV scores were closer, recent graduates of entirely online programs had significantly more diverse networks in terms of both alter role (U=3334.0, $p<0.05$) and age (U=3082.0, $p<0.01$) than their peers with low and medium-high online class intensity levels. On the contrary, graduates of entirely online programs had significantly less diverse networks in terms of alter role than their peers among those graduated over a year or two ago (U=1841.0, $p<0.001$) and over two years ago or earlier (U=5070.0, $p<0.05$). No statistically significant differences were observed for age within these two temporal proximity categories. Although graduates' networks were highly diverse, no statistically significant differences were detected among graduates in terms of their age groups.

4.3 Quality: Employment Outcomes

The quality of an ego's network is assessed in terms of its ability to result in a successful outcome for the ego in the form of a new employment. For 95% of the respondents, the helping contact was aware that the respondent was job-hunting, and in most cases (76.7%) the respondent had told the helping contact. Descriptive analysis of alters' roles that led to a job opportunity for the ego are listed in Table 8. Overall, about 41% of the job opportunities were provided by alters who were LIS professionals whereas about 10% of the opportunities were provided by contacts who were MLIS Peers. Graduates relied more on their LIS professional contacts for job opportunities but those who had face-to-face experiences relied more on their MLIS peers.

Ordinal measures of age, relationship duration, and closeness were used in the binary logistic regression model as part of the maximum likelihood estimation procedure. Respondents who found new employment after graduation were included in the analysis. The overall model for recent graduates was statistically significant (p=0.000) and correctly predicted 75.4% of the cases. The logistic regression coefficient, standard error, Wald's chi-square, p-value and odds ratio for each of the predictors are shown in Table 8. The Wald and associated p-value are used to test the statistical significance of each coefficient (β) in the model [53]. The binary logistic model revealed that one estimated coefficient (alter age) was statistically significant at the 0.05 level.

Table 8. Binary Logistic Regression Results: Recent Graduates (n=57)

	β	S.E.β	Wald's χ^2	df	p	Odds ratio (e^{β})

Age*	.596	.240	6.147	1	.013	1.815
Relationship Duration	-.781	.512	2.329	1	.127	.458
Closeness	-.023	.432	.003	1	.958	.977
Constant	-1.517	1.430	1.125	1	.289	.219

* $p<0.05$

The estimated coefficient of alter's age was greater than 0 and the exponential coefficients (odds ratios) of alter age exceeded 1. When a coefficient is greater than 1, there is a greater likelihood that ego's relationship with alters will increase the ego's ability to procure employment as a result. The odds ratio value associated with alter's age is 1.815. Hence when alter's age is increased by one level (e.g., under 24 to 25-34 age group), the odds ratio is about two times as large therefore an ego is 1.8 times more likely to procure an employment as his/her alters' age increases.

The overall model for respondents who graduated over a year or two ago was not statistically significant. Since job mobility of these graduates was very small, no further analysis was conducted. However, the model for those who graduated over two years ago or earlier was statistically significant ($p<0.01$) and correctly predicted 75.7% of the cases. The binary logistic regression are shown in Table 9. The binary logistic model revealed that one estimated coefficient (alter age) was statistically significant at the 0.01 level.

Table 9. Binary Logistic Regression Results: Graduated over a year ago or earlier (n=310)

	β	S.E.β	Wald's $\chi 2$	df	p	Odds ratio (eβ)
Age*	.381	.136	7.858	1	.005	1.464
Relationship Duration	.219	.249	.778	1	.378	1.245
Closeness	.250	.278	.806	1	.369	1.284
Constant	-3.576	.897	15.890	1	.000	.028

* $p<0.01$

The odds ratio value associated with alter's age is 1.464. Therefore an ego who graduated over a year ago or earlier is about 1.5 times more likely to procure an employment as his/her alters' age increases.

5. Discussion

The results of this study provide an important empirical evidence that the social capital of graduates with different program modalities differ. Consistent with previous research [11,13,54], the results showed that social networks as a form of social capital can be instrumental in procuring employment.

Results consistently showed at statistically significant levels that graduates who took a majority or some of their courses in traditional face-to-face connected more with their peers than their entirely online peers across three temporal proximity levels. This finding supports the notion that

MLIS students in entirely online programs are unable to bond with their peers [41] due to barriers such as temporal and geographical separation [5–7,39,40], which in turn limited the scope of their accessed social capital as evidenced in a strong preference of graduates of entirely online programs to connect with alters with different roles.

Job mobility of graduates who were under 34 was much higher than their older peers [33]. This finding supports the notion that these graduates were still in their early career stages. They mostly retained their employments upon graduation and sought new opportunities as they gained more experience. In the process, graduates with face-to-face experiences increased their access to and use of LIS professionals as well as non-professional contacts in their networks.

Graduates' relationships with alters were more established and included mostly strong ties and their interactions were somewhat frequent with monthly or more often correspondences. According to Lin [11], graduates may be at a disadvantage as they are more likely to receive redundant information from their networks due to lower density of weak ties. Networks of recent graduates of entirely online programs were significantly much diverse in terms of both alter's role and age than their peers who had face-to-face experiences, however, networks were much similar in terms of level of diversity for those who graduated over two years ago or earlier. Moreover, networks of graduates with face-to-face experiences were significantly more diverse than their entirely online peers.

Although graduates' networks were fairly diverse in terms of alters' role and age, consistent with McDonald and Mair [45], results of the binary logistic regression provided evidence that age may be used as a proxy for alters' social resources. Graduates whose networks featured relatively older alters who themselves may have very diverse networks [33] contributed greatly to graduates employment procurement efforts as argued by Lin [11] and Nahapiet & Ghoshal [27].

6. Conclusion and Future Research

Measuring one's social capital is a complex task. The current study focused on a very specific perspective to better understand how online education impacts students' ability to form social networks with their peers from school. The results showed recent graduates' networks differed significantly in terms of who they chose to contact with while they looked for employment. At first, recent graduates of entirely online programs appeared to have a deficit in their social capital in terms of including MLIS peers and faculty/staff in their networks in their quest for new employment. However, the results highlighted that such a deficit may not be an important issue after all as a majority of the jobs were found with the information provided by LIS professional contacts whereas contribution of MLIS peers was minimal. Furthermore, investing in contacts who are relatively older than self can be a better choice for graduates to build their social networks because graduates are more likely to access more diverse occupational networks via such contacts. MLIS peers with no or limited job experience in the field are less likely to fully grasp the realities on the ground. On the other hand, LIS professionals are aware of the working climate and trends, and have a better sense of the field. Additionally, LIS professionals may be in a position of influence that can impact employment outcomes for the graduate.

It should be noted that increased enrollments of students who are under 29 may induce age homophily which in turn limit the scope of MLIS graduates' networks and put them at a disadvantage. However, these new graduates may greatly benefit from their MLIS peers' support [41] as they enter the field. Although this may present a challenge from an employment perspective, it may be an opportunity for professional development purposes for the graduate. A future research focusing on the impact of online education and peer support on graduates' professional development and growth after graduation can enhance our understanding. An ego centric approach can be an appropriate method to explore this particular aspect of social capital. A longitudinal study tracking the development of graduates' social networks as they enter the program and until about three years after graduation help better explain the effects of different course modalities on students' social capital. Also a further research on the impact of various platforms such as conferences, and meet and greet type of gatherings in increasing access of graduates of face-to-face and online programs to LIS professionals to enhance the scope of their networks may help LIS programs to be more intentional in their programmatic activities.

6.1 Limitations

Three LIS programs were chosen purposefully because of the different course modalities employed; however, graduates of these programs were not representative of all LIS graduates. Generalizations cannot be made to all LIS students due to the sampling strategy. Graduates who received a majority of their instruction in face-to-face format constituted about 30% of all respondents; therefore, the results may have been somewhat skewed.

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